



# Best Practices: Case Study — Vendor Neutral Archiving Drives Improved Productivity, Storage Costs, and Care Quality at London Health Sciences Centre, Ontario

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IDC Health Insights: Healthcare Provider IT Strategies

BEST PRACTICES

#HI239669

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## IDC HEALTH INSIGHTS OPINION

This IDC Health Insights case study focuses on the implementation of vendor neutral archiving (VNA) at London Health Sciences Centre (LHSC) in London, Ontario, Canada. Growing storage requirements, new business models, and changing clinical needs for PACS workflow have been driving the implementation of VNA worldwide. The Southwestern Ontario Digital Imaging Repository (SWO DI-r) archive consolidation project to implement VNA encompassed 54 hospitals, 14 existing PACSs, 8 vendor platforms, and multiple instances of many of these systems. Faced with the growing storage costs and the need to facilitate sharing and access to images across the hospitals and PACS installations within the SWO DI-r, regional leadership at LHSC began VNA implementation in 2008. IDC Health Insights believes that:

- The introduction of VNA changes the architecture and economics of PACS by separating the proprietary storage and archiving components, while the PACS software's functionality grows to include distributing images, reports, workflow, and visualization tools across the enterprise's workstations and clinical applications.
- The architecture change created by the implementation of VNA offers the opportunity for providers to share information across multiple facilities, create longitudinal imaging records for patients, allow remote reading of images and, among other benefits, optimize the cost of long-term image archiving while providing better options for business continuity and disaster recovery.

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## **IN THIS STUDY**

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### **Methodology**

The goal of this case study is to provide an objective representation of the benefits that accrue from the best practice–based implementation of VNA. LHSC and the Southwestern Ontario Digital Imaging Repository added VNA to its solution portfolio to establish a regional image repository, standardize services and policies across the archive, access storage efficiencies, and create collaboration among providers. This study is intended to present the implementation of VNA at LHSC; examine the business issues VNA addresses and the IT approach, the business goals and ROI from the project, and the business risk and situational complexity; and provide insight into the successes and failures of and lessons learned from the implementation.

During the course of this case study, IDC Health Insights conducted an interview with David Veeneman, PACS/DI-r manager at LHSC, and also held briefings with GE Healthcare, the supplier of LHSC's VNA technology. IDC Health Insights previously conducted primary research with other VNA implementations as well as additional primary and secondary research on the topic. This case study presents the challenges, experiences, and benefits associated with VNA implementations across the healthcare industry.

### **SITUATION OVERVIEW**

Historically, first-generation PACSs widely implemented around the turn of the century provided for the digital capture of images from multiple modalities, with centralized storage and retrieval. Early PACSs managed the task of storage and retrieval of newly implemented digital images in proprietary forms of the DICOM imaging standard, with attached proprietary storage and dedicated workstations for radiologist and technicians. As PACS technology advanced, functionality requirements grew, replacements began, and image repositories expanded, providers started to demand the availability of standard formats for stored images to facilitate migrations and to allow for archiving and access to low-cost commodity storage. This demand led to the introduction of VNA, which changed the architecture and economics of PACS by separating the proprietary storage and archiving components from the PACS software. The PACS software's functionality has grown to include distributing images, reports, workflow, and advanced image and visualization tools across the enterprise's workstations and clinical applications. The PACS maintains a storage cache of active images, with varying degrees of archiving capabilities, complemented by those of the VNA when used in conjunction. The architecture change created

by the implementation of VNA alongside PACS offers the opportunity for providers to share information across multiple facilities, create longitudinal imaging records for patients, allow remote reading of images and, among other benefits, optimize the cost of long-term image archiving while providing better options for business continuity and disaster recovery.

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## **Business Needs**

The Southwestern Ontario Digital Imaging Repository comprises 54 hospitals and many ambulatory sites, as well as other service offerings and administrative services across the province of Ontario, Canada. Regional IT support is provided by LHSC. The VNA implementation discussed in this case study began in 2008. This case study focuses on the implementation that is already completed in the 54 hospitals; subsequent stages of the project will extend the VNA into the ambulatory clinics, with three clinics scheduled to come onto the repository in 2013. The region conducts upward of 3 million radiology exams across multiple modalities each year in its hospitals. The VNA's current capacity is 500Tb, with growth of 100Tb expected annually; the required storage and growth rate is expected to increase by 45% with the addition of the ambulatory repositories over time. The massive archive includes DICOM images as well as DICOM-wrapped objects, such as scanned documents, and limited types of video from echocardiology. Future non-DICOM projects being explored include storage of HL-7 CDA-wrapper reports, adding MP4 videos from cardiology PACS, JPEGs and photographic exams, and records to the VNA. Ontario has a provincial upgrade program in progress; the VNA project is running concurrently with projects to implement IHE standards across the clinical IT environment, integrate with a regional clinical portal, and connect its multiple EHR environments.

Veeneman's team at LHSC was responsible for coordinating implementation efforts at PACS sites and hospitals throughout the province, working with local radiology departments and IT groups. The project cost was funded by eHealth Ontario, which includes an ongoing operational subsidy, with the balance of ongoing operating costs shared by participating organizations.

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## **Management Challenges**

### ***Business Drivers***

At LHSC, the VNA implementation objective was to consolidate imaging into a central location and streamline provider access to images and reports across the entire province. To do this, and implement a standards-based infrastructure in the process, a business case needed to be made for integration across multiple hospitals and departments within the province. Business drivers for the VNA include:

- **Leverage economies of scale in storage architecture.** Reduce costs by leveraging economies of scale in its storage architecture while providing improved, standardized services; failover; and disaster recovery across the network.
- **Enhance quality of care.** Enhance the quality of care by making images available to providers, regardless of location, and facilitating collaboration between providers at different clinics. For example, prior to the implementation, radiologists either did not have access to images performed at other institutions or had to go through a lengthy process to request a CD of an exam; with the VNA in place, radiologists can access images from the centralized repository. Patients now have a longitudinal imaging record within the repository.
- **Improve patient experience.** Image availability provides a better experience for patients and is expected to reduce repeat exams and travel requirements as patients in remote clinics can now have imaging performed in their community while accessing remote health services.

## **THE BEST PRACTICES**

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### **The Solution**

LHSC selected GE's VNA solution in 2008 after an evaluation of other vendors in the market. The GE technology takes advantage of a large, dual-datacenter, high-reliability architecture with automated failover. The GE VNA includes a repository for imaging infrastructure, consolidation, and an enterprise image viewer for mobile access to a comprehensive patient jacket across the region of Ontario.

LHSC already had GE's Centricity OneView technology in place that allowed shared radiology workflow across the region, interfaced with Ontario's multiple EHR systems. OneView also provides a master patient index (MPI) for linking patient records across the facilities. LHSC chose to upgrade to the GE VNA technology as it found the technology met its needs and avoided a larger storage migration. HP was selected as the storage provider for the VNA's storage layer.

At the time this report was written, the LHSC VNA has been deployed in 54 hospitals across Ontario, connecting 14 different PACS systems and managing 3.2 million exams per year with 1,800+ concurrent users. The usage by physicians continues to expand. Radiologists' use of the VNA for viewing images from other hospitals depends on awareness and training, as the VNA viewer is currently separate from their local PACS and their EHR. Each of the 54 hospitals has its own EHR system in addition to the distributed PACSs, with multiple vendor supplied systems and instances in use. The VNA project at

LHSC is proceeding in parallel with a regional effort to implement a regional portal for clinician use. The implementation of the regional portal and a universal viewer will close the loop on integration with the EHR and is expected to drive more use of the archive by providers by increasing ease of access.

At the outset, with 8 different PACS vendors and 16 PACS installs being migrated to the VNA, proprietary DICOM implementations were expected to be a problem. In several cases, annotations in proprietary formats failed to archive to the VNA and required fine-tuning, creating some delays. Local PACS upgrades were ongoing during the VNA project but did not slow down the VNA project. According to LHSC, the robust VNA integration has allowed local PACS upgrades to proceed without interrupting their archiving to the DI-r. LHSC used its own project managers and teams in the VNA implementation, alongside professional services from GE and HP. The project required LHSC to expand its network capacity, improving performance of network links across the large geography to support performance requirements.

The governance structure put in place to manage the centralization of the repository at LHSC was quite innovative and played a key role in the smooth execution of the project. A group called the customer council was established to represent individual hospitals and allow their input into the road map. The customer council is responsible for operational oversight and strategic decisions and helps to maintain buy-in for the project from the local hospitals. The individual hospitals' IT groups and clinicians contributed significant effort in the implementation, as they worked with their EHR and PACS vendors and set up firewalls, networks, and interfaces.

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## **Benefits**

The implementation of VNA at LHSC has clearly achieved its goal of enhancing and streamlining provider access to images across the entire province, alongside the implementation of a standards-based infrastructure. The implementation has resulted in both expected and unexpected benefits. In detail:

- **Economies of scale.** Centralizing the imaging repository created economies of scale and reduced costs associated with maintaining image repositories. At LHSC, the site of the repository, there were some up-front costs to purchase the Web viewer for providers to access the VNA, and as the site went from archiving 380,000 exams per year to 3 million exams per year, LHSC estimates that total archive costs on a per exam basis fell by 50% due to the economies of scale.

**Disaster recovery.** While LHSC had multilocation backup and disaster recovery solutions in place, many of the local hospitals

involved in the implementation did not. The VNA allowed LHSC to deliver multilocation image recovery to all the sites at neutral cost or better.

- **Enhance the quality of care.** The VNA enhances the quality of care by consolidating patient records from disparate sources, thereby enabling a longitudinal imaging record for the patient. This allows providers to collaborate and consult across multiple locations.
- **Faster image availability.** Images are available to providers as they are captured, often in near real time or with only momentary delays in most cases, better meeting the delivery requirements of providers when compared with both previous electronic systems or manual CD and film sharing. This helps improve care quality and provider productivity.
- **Cost of care.** The VNA allows access to images in multiple locations, reducing the need for repeat imaging when patients are treated in multiple locations and images are not available. As images in the repository are further integrated with the EHR as a result of the portal project, further opportunities to reduce clinical waste are expected.
- **Patient experience.** Patient experience is improved as a result of image availability, creating a more comfortable care experience and offering the opportunity to reduce travel as patients can receive imaging in the community but access remote services from specialist providers.
- **Improved training opportunities.** As an unexpected benefit, the hospitals sharing the VNA have found that the repository improves teaching and training and supports interhospital multidisciplinary clinical rounds.
- **Image consolidation.** Images from multiple sources have been consolidated in a single location in the new repository, reducing the number of duplicate images in storage.
- **Starting conversations about best practices in imaging.** LHSC expects to realize more benefits in the future as it begins to layer business intelligence and mine data from the VNA. Observations such as the size of an identical CT from one organization being three times the size of another have begun to fuel discussions about best practices in image ordering. As the clinical community has begun to use VNA, demands for more functionality and integration with PACS and EHR are growing. Further provider productivity enhancements are expected with future technology implementations and integration.

## Lessons Learned

The VNA implementation at LHSC has clearly been successful at achieving its goals, with significant benefits for the organization. Lessons learned include:

- **Make the value proposition clear up front and get buy-in from departments.** The customer council allowed local hospitals to understand the value proposition associated with the VNA and provide input to the road map. This strong governance approach helped get buy-in and the effort from local teams that were needed to execute the implementation effectively.
- **Don't underestimate infrastructure issues.** Network issues were more significant than expected, and significant effort was required to optimize the network to support the movement of the large data sets required for the VNA.
- **Plan for time and effort to handle nonstandard systems and proprietary formats.** Issues associated with proprietary systems caused some grief and delays to the VNA project; these challenges should not be underestimated. An experienced VNA provider with imaging domain expertise can help to minimize interruptions to projects.
- **Interoperable, standards-based solutions are critical.** VNA solutions should adhere to standards and support vendor neutrality across applications and IT platforms to help ensure faster rollout and continuous benefit realization.

## FUTURE OUTLOOK

The Southwestern Ontario Digital Imaging Repository has clearly been able to provide significant service enhancements as well as cost savings by centralizing its image archiving and distribution in a VNA. The archive consolidation project executed by LHSC encompassed 54 hospitals, 16 existing PACSs, 8 vendor platforms, and multiple instances of many of these systems, and the project was reported to have reduced storage costs, where measured, by as much as 50%. The VNA architecture provides a logical approach to meeting the growing storage and software needs of radiology departments as well as the entire provider organization and community. Provider satisfaction, productivity, cost, and quality-of-care improvements are expected to grow further with EHR and additional workflow integration. The implementation of VNA presented a clear win for Ontario clinicians and IT, and the future will entail rollout at additional sites as well as expand the role of the VNA in provider workflows.



VNA has a clear value proposition for healthcare provider organizations struggling to manage growing storage needs and simplify and reduce costs associated with image storage, archiving, and PACS upgrades. The ability to incorporate agility into the clinical environment and optimize costs and efficiency associated with storage will become even more important to providers as healthcare reform proceeds. The demands of network-based accountable care will require providers to collaborate across multiple organizations, which technologies like VNA will help facilitate.

## **ESSENTIAL GUIDANCE**

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### **Actions to Consider**

Provider IT departments considering the implementation of VNA should:

- Perform an initial assessment of the current PACS and EHR applications, functionality, architecture, and integration needs to determine the extent of the project and the requirements for the VNA. Speak with clinicians and departmental IT (if applicable) to determine the level of pain associated with storage management, PACS upgrades, and expenses, and to build support for the implementation. Proprietary storage formats should be a focus, as they will provide many of the headaches associated with implementation, and should be considered in the selection of the VNA provider. Available datacenter resources should be considered if sufficient and cloud-based solutions should be considered when the available datacenter resources are insufficient.
- Determine the scope of the VNA project, which hospitals and departments will be included, and what functionality will be made available. Integration with the workflow and single sign-on from the RIS, local PACS, and the EHR will help achieve maximum benefits from the VNA implementation. Providers will leverage the archive to the extent that it is easy to identify and access available images from within existing workflows. Visibility and training of providers on using the archive, as well as minimizing the clicks and time required to get to images, will drive adoption by clinicians.
- Understand that the implementation of VNA represents a massive infrastructure change. Security, network, business continuity, and disaster recovery implications need to be considered when making these changes. PACS is a mission-critical application to clinical providers, and downtime associated with VNA implementation needs to be minimized or prevented with redundancy.

- Present the value proposition to clinical and financial leaders, being clear about the gains to productivity and patient satisfaction, service improvements, and cost benefits that can be expected from the implementation of VNA.
- Establish a strong governance approach to manage the different hospitals and departments involved in the implementation. While the implementation of VNA reflects centralization of PACS and increased control of the imaging environment by IT as the storage environment is rationalized, radiology departments need to be involved and lead clinical and functionality decisions.

## **LEARN MORE**

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### **Related Research**

- *Perspective: A Fresh Approach and Architecture for Clinical Analytics — Healthcare Quality Catalyst* (IDC Health Insights #HI239639, forthcoming)
- *U.S. Health Industry Provider 2013 Top 10 Predictions: Providers Move into New Business Models While Meaningful Use Adoption Continues* (IDC Health Insights #HI238411, December 2012)
- *U.S. Connected Health IT 2013 Top 10 Predictions: The Consumer Takes Center Stage* (IDC Health Insights #HI238619, December 2012)
- *U.S. Accountable Care 2013 Top 10 Predictions: Accountable Care IT Strategies, a Period of Maturity Ahead* (IDC Health Insights #HI238485, December 2012)
- *Technology Selection: Cloud Computing for Providers — Value, Benefits, and Considerations Associated with Moving to the Cloud* (IDC Health Insights #HI237176, October 2012)
- *Technology Selection: The Emerging Demand to Support Patient Engagement in U.S. Provider Organizations* (IDC Health Insights #HI237046, September 2012)
- *Business Strategy: The Accountable Care Application Portfolio* (IDC Health Insights #HI235377, June 2012)

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## **Synopsis**

This IDC Health Insights report focuses on the implementation of vendor neutral archiving (VNA) at London Health Sciences Centre (LHSC) in London, Ontario, Canada. Growing storage requirements, new business models, changing clinical needs for PACS workflow, new functionality, and device independence have been driving the replacement of PACS and the implementation of VNA worldwide. VNAs offer the opportunity for providers to share images and other data across multiple facilities, improve care quality and patient satisfaction, and decrease the cost of long-term image archiving while providing better options for business continuity and disaster recovery.

According to Judy Hanover, research director, IDC Health Insights, "The VNA implementation at LHSC provides an example of the efficiencies and benefits that can be achieved by effective use of VNA with PACS and the opportunity to better leverage technology to deliver network-based care."

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